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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Vijayan Rajan

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EXAMINER

ZHEN, LI B

ART UNIT

PAPER NUMBER

2194

MAIL DATE

DELIVERY MODE

09/11/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 09/828,271	Applicant(s) RAJAN ET AL.	
	Examiner LI B. ZHEN	Art Unit 2194	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 June 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 11, 12, 14, 16, 23 and 30-37 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 11, 12, 14, 16, 23 and 30-37 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>6/20/2008</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Claims 11, 12, 14, 16, 23 and 30 – 37 are pending.

Continued Examination Under 37 CFR 1.114

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 6/20/2008 has been entered.

Response to Arguments

3. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2194

5. **Claims 11, 12, 14, 16, 23 and 30 – 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,366,945 to Fong et al. [hereinafter Fong] in view of U.S. Patent No. 6,745,222 to Jones et al. [hereinafter Jones].**

6. As to claim 11, Fong teaches a method comprising:

running a plurality of tasks [allocate its tasks between its leaf partitions; col. 6, lines 33 – 50] in a multiprocessor system that includes a plurality of processors [Resources can include, but are not limited to, processors; col. 3, lines 10 – 32], each processor having an identity [col. 5, lines 5 – 22];

scheduling the plurality of tasks using a plurality of scheduling domains [lower level scheduler within its partition; col. 5, lines 42 – 67] by scheduling tasks on a processor independent of the identity of the processor [hierarchical scheduling framework makes it possible to incorporate a variety of different scheduling schemes into the system to maximize efficient utilization of a myriad of applications; col. 5, lines 5 – 22 and col. 6, lines 10 – 26], wherein none of the plurality of scheduling domains is bound to any one processor of the plurality of processors [dynamic re-allocation of resources among partitions and subpartitions which may use different scheduling schemes; col. 3, line 54 – col. 4, line 8];

wherein each of the one or more resources is assigned to one of the scheduling domains [repartitioning of resources among the partitions occurs dynamically as the top level manage function periodically re-evaluates the state of the system and the FDP reallocation function; col. 5, lines 21 – 42];

prohibiting tasks that are each associated with a same scheduling domain from running concurrently [determination is made as to whether there is any task waiting for resources at 148; col. 8, lines 42 – 52];

allowing tasks that are each associated with different scheduling domains to run concurrently [computing nodes, 30, of each domain, where each node represents a unit of resources, are then divided into multiple independent partitions, 31 and 36. The nodes of each partition can be further divided into a number of non-overlapping subpartitions, 32 and 33 as shown for partition 31, depending upon the policies associated with the partition; col. 5, lines 5 – 22]; and

changing association of a task of the plurality of tasks from a first scheduling domain to a second scheduling domain, if the task requests a shared resource assigned to the second scheduling domain [FDP 403 reallocates the resources to application partitions, 44-46, every time a job arrives or leaves. In this case, the reallocation triggers are job arrivals and departures; col. 6, lines 33 – 50]. Fong does not specifically teach implicitly synchronizing the tasks with regard to one or more resources shared by the tasks in the system by associating the tasks with the scheduling domains.

However, Jones teaches running a plurality of tasks [col. 24, lines 15 – 52] in a multiprocessor system that includes a plurality of processors [col. 7, line 63 – col. 8, line 13], each processor having an identity [col. 22, lines 28 – 38], scheduling the plurality of tasks using a plurality of scheduling domains [group of related threads; col. 23, lines 15 - 30], implicitly synchronizing the tasks with regard to one or more resources shared by the tasks in the system by associating the tasks with the scheduling domains

Art Unit: 2194

[Synchronization mechanisms are a feature of multitasking operating systems that coordinate the use of a particular resource of the computer system by different threads; col. 28, lines 6 – 24], prohibiting tasks that are each associated with a same scheduling domain from running concurrently [“blocks” or suspends the execution of, the thread attempting to acquire the mutex, until the mutex becomes available; col. 28, lines 6 – 25] and allowing tasks that are each associated with different scheduling domains to run concurrently [threads in the gang are attempted to be scheduled on different processors at the same times, allowing them to make progress in parallel as a group; col. 23, lines 15 – 31].

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the invention of Fong to incorporate the features of Jones. One of ordinary skill in the art would have been motivated to make the combination because this provides predictable scheduling of real-time programs and non-real-time programs using a repeating precomputed schedule [col. 3, lines 19 – 52 of Jones].

7. As to claim 12, Fong as modified teaches a system comprising:

a plurality of processors [col. 3, lines 10 – 32 of Fong and col. 7, line 63 – col. 8, line 13 of Jones], each processor having an identity [col. 5, lines 5 – 22 of Fong and col. 22, lines 28 – 38 of Jones];

a memory coupled to each of the plurality of processors [col. 7, lines 32 – 63 of Jones], the memory storing data defining a set of tasks [col. 6, lines 33 – 50 of Fong

Art Unit: 2194

and col. 24, lines 15 – 52 of Jones], each task of the set of tasks being runnable on more than one of the processors [col. 6, lines 33 – 50 of Fong], each the task being associated with one of a plurality of scheduling domains [col. 5, lines 42 – 67 of Fong], each of the plurality of scheduling domains controlling one or more shared resources [col. 3, line 54 – col. 4, line 8 of Fong]; and

a scheduler to schedule the set of tasks using a plurality of scheduling domains [col. 5, lines 42 – 67 of Fong] by scheduling tasks on a processor independent of the identity of the processor [col. 5, lines 5 – 22 and col. 6, lines 10 – 26 of Fong], wherein none of the plurality of scheduling domains is bound to any one processor of the plurality of processors [col. 3, line 54 – col. 4, line 8 of Fong], where the scheduler prohibits tasks that are each associated with a same scheduling domain from running concurrently [col. 8, lines 42 – 52 of Fong and col. 28, lines 6 – 25 of Jones] but allows tasks that are each associated with a different one of the plurality of scheduling domains to run concurrently [col. 5, lines 5 – 22 of Fong and col. 23, lines 15 – 31 of Jones], and wherein the scheduler changes association of a task of the set of tasks from a first scheduling domain to a second scheduling domain [col. 6, lines 33 – 50 of Fong] in response to the task's request for a shared resource controlled by the second scheduling domain [col. 7, lines 29 – 45 of Fong].

8. As to claim 23, Fong as modified teaches a process comprising:

scheduling a plurality of tasks in a multiprocessor system that includes a plurality of processors [col. 3, lines 10 – 32 of Fong and col. 7, line 63 – col. 8, line 13 of Jones],

Art Unit: 2194

each processor having an identity [col. 5, lines 5 – 22 of Fong and col. 22, lines 28 – 38 of Jones], by scheduling tasks [col. 6, lines 33 – 50 of Fong and col. 24, lines 15 – 52 of Jones] on a processor independent of the identity of the processor [col. 5, lines 5 – 22 and col. 6, lines 10 – 26 of Fong], wherein none of the plurality of scheduling domains is bound to any one processor of the plurality of processors [col. 3, line 54 – col. 4, line 8 of Fong];

performing implicit synchronization of the plurality of tasks [col. 28, lines 6 – 24 of Jones], the implicit synchronization dividing the tasks into the scheduling domains [col. 5, lines 42 – 67 of Fong], at least one of the scheduling domains being associated with at least two tasks of the plurality of tasks [col. 6, lines 33 – 50 of Fong and col. 24, lines 15 – 52 of Jones] and a resource shared by the at least two tasks [col. 3, line 54 – col. 4, line 8 of Fong], and wherein tasks within a same scheduling domain are prohibited from running concurrently [col. 8, lines 42 – 52 of Fong and col. 28, lines 6 – 25 of Jones] even if run on different processors and tasks that are each from a different scheduling domain are allowed to run concurrently [col. 5, lines 5 – 22 of Fong and col. 23, lines 15 – 31 of Jones]; and

moving a task of the plurality of tasks from a first scheduling domain to a second scheduling domain [col. 6, lines 33 – 50 of Fong], in response to the task's request of a resource controlled by the second scheduling domain [col. 7, lines 29 – 45 of Fong].

9. As to claim 30, Fong as modified teaches a method of scheduling a plurality of processes in a multiprocessor system, the method comprising:

Art Unit: 2194

associating the plurality of processes [col. 6, lines 33 – 50 of Fong and col. 24, lines 15 – 52 of Jones] with a plurality of scheduling domains [col. 5, lines 42 – 67 of Fong] wherein none of the plurality of scheduling domains is bound to any one processor in the system [col. 3, line 54 – col. 4, line 8 of Fong], and wherein each of the processes is executed by a processor independent of an identity of the processor [col. 5, lines 5 – 22 and col. 6, lines 10 – 26 of Fong];

implicitly synchronizing the plurality of processes [col. 28, lines 6 – 24 of Jones] by prohibiting concurrently executing processes that are each associated with a same scheduling domain [col. 8, lines 42 – 52 of Fong and col. 28, lines 6 – 25 of Jones] but allowing concurrently executing processes that are each associated with a different one of the plurality of scheduling domains [col. 5, lines 5 – 22 of Fong and col. 23, lines 15 – 31 of Jones]; and

changing association of a first process of the plurality of processes from a first scheduling domain to a second scheduling domain [col. 6, lines 33 – 50 of Fong], if the first process requests a resource associated with the second scheduling domain [col. 7, lines 29 – 45 of Fong].

10. As to claim 34, Fong as modified teaches a method implemented in a multiprocessor system, the method comprising:

executing a software program that defines a plurality of tasks [col. 6, lines 33 – 50 of Fong and col. 24, lines 15 – 52 of Jones] and assigns each of the plurality of tasks to one of a plurality of scheduling domains [col. 5, lines 42 – 67 of Fong], wherein none

Art Unit: 2194

of the plurality of scheduling domains is bound to any one processor in the system [col. 3, line 54 – col. 4, line 8 of Fong];

running a plurality of processes, each of the plurality of processes performing a different one of the plurality of tasks [col. 6, lines 33 – 50 of Fong and col. 24, lines 15 – 52 of Jones], wherein each of the plurality of processes is run by a processor independent of an identity of the processor [col. 5, lines 5 – 22 and col. 6, lines 10 – 26 of Fong];

prohibiting concurrently executing processes performing tasks that are each assigned to a same scheduling domain [col. 8, lines 42 – 52 of Fong and col. 28, lines 6 – 25 of Jones];

allowing concurrently executing processes performing tasks that are each assigned to a different one of the plurality of scheduling domains [col. 5, lines 5 – 22 of Fong and col. 23, lines 15 – 31 of Jones]; and

allowing changing assignment of at least one task from a first scheduling domain to a second scheduling domain during executing the software program [col. 6, lines 33 – 50 of Fong], if the at least one task requests a resource assigned to the second scheduling domain [col. 7, lines 29 – 45 of Fong].

11. As to claim 35, Fong as modified teaches a processing system comprising:

a plurality of processors [col. 3, lines 10 – 32 of Fong and col. 7, line 63 – col. 8, line 13 of Jones], each processor having an identity [col. 5, lines 5 – 22 of Fong and col. 22, lines 28 – 38 of Jones];

Art Unit: 2194

a memory coupled to each of the plurality of processors [col. 7, lines 32 – 63 of Jones], the memory storing instructions which, when executed by one or more of the plurality of processors, cause the one or more of the plurality of processors to perform a method comprising:

executing a software program associating a plurality of tasks [col. 6, lines 33 – 50 of Fong] with a plurality of scheduling domains [col. 5, lines 42 – 67 of Fong] and assigning a plurality of resources to the plurality of scheduling domains [col. 5, lines 42 – 67 of Fong], wherein none of the plurality of scheduling domains is bound to any one processor of the plurality of processors [col. 3, line 54 – col. 4, line 8 of Fong], and wherein each task of the plurality of tasks is scheduled on one of the processors independent of the identity of the processor [col. 5, lines 5 – 22 and col. 6, lines 10 – 26 of Fong];

prohibiting concurrently executing processes to perform tasks that are each associated with a same scheduling domain [col. 8, lines 42 – 52 of Fong and col. 28, lines 6 – 25 of Jones] but allowing concurrently executing processes to perform tasks that are each associated with a different one of the plurality of scheduling domains [col. 5, lines 5 – 22 of Fong and col. 23, lines 15 – 31 of Jones]; and

changing association of a first task of the plurality of tasks from a first scheduling domain to a second scheduling domain [col. 6, lines 33 – 50 of Fong], if a process performing the first task requests a resource assigned to the second scheduling domain [col. 7, lines 29 – 45 of Fong].

Art Unit: 2194

12. As to claim 36, Fong as modified teaches a computer-readable storage medium storing instructions therein which, when executed by one or more processors of a processing system, cause the one or more processors to perform a method comprising:

executing a software program that defines a plurality of tasks [col. 6, lines 33 – 50 of Fong] and assigns each of the plurality of tasks to one of a plurality of scheduling domains [col. 5, lines 42 – 67 of Fong], wherein none of the plurality of scheduling domains is bound to any one processor in the system [col. 3, line 54 – col. 4, line 8 of Fong];

running a plurality of processes, each of the plurality of processes performing a different one of the plurality of tasks [col. 6, lines 33 – 50 of Fong], wherein each of the processes is run on a processor independent of the identity of the processor [col. 5, lines 5 – 22 and col. 6, lines 10 – 26 of Fong];

prohibiting concurrently executing processes performing tasks that are each assigned to a same scheduling domain [col. 8, lines 42 – 52 of Fong and col. 28, lines 6 – 25 of Jones];

allowing concurrently executing processes performing tasks that are each assigned to a different one of the plurality of scheduling domains [col. 5, lines 5 – 22 of Fong and col. 23, lines 15 – 31 of Jones]; and

allowing changing assignment of at least one task from a first scheduling domain to a second scheduling domain during executing the software program [col. 6, lines 33 – 50 of Fong], if the at least one task requests a resource assigned to the second scheduling domain [col. 7, lines 29 – 45 of Fong].

13. As to claim 37, Fong as modified teaches a method, comprising:

associating a task of a plurality of tasks [col. 6, lines 33 – 50 of Fong] with a scheduling domain of a plurality of scheduling domains [col. 5, lines 42 – 67 of Fong], wherein the plurality of tasks share one or more resources [col. 3, line 54 – col. 4, line 8 of Fong] and each of the one or more resources is assigned to one of the plurality of scheduling domains [col. 5, lines 42 – 67 of Fong];

scheduling the task, using the scheduling domain [col. 3, lines 10 – 32 of Fong and col. 7, line 63 – col. 8, line 13 of Jones], on a processor in a multiprocessor system that includes a plurality of processors [col. 3, lines 10 – 32 of Fong and col. 7, line 63 – col. 8, line 13 of Jones], independent of an identity of the processor [col. 5, lines 5 – 22 and col. 6, lines 10 – 26 of Fong];

prohibiting tasks that are each associated with a same scheduling domain from running concurrently [col. 8, lines 42 – 52 of Fong and col. 28, lines 6 – 25 of Jones];
and

allowing tasks that are each associated with different scheduling domains to run concurrently [col. 5, lines 5 – 22 of Fong and col. 23, lines 15 – 31 of Jones].

14. As to claim 14, Fong teaches at least one of the set of tasks is associated with more than one scheduling domain of the plurality of scheduling domains [col. 6, lines 33 – 50].

Art Unit: 2194

15. As to claim 16, Fong as modified teaches a scheduler includes a plurality of runnable queues one per scheduling domains [col. 20, line 50 – col. 21, line 29 of Jones].

16. As to claim 31, Fong as modified teaches allowing concurrently executing processes that are not associated with any one of the plurality of scheduling domains [col. 8, lines 42 – 52 of Fong and col. 28, lines 6 – 25 of Jones].

17. As to claim 32, Fong teaches at least one of the plurality of processes is associated with more than one of the plurality of scheduling domains [col. 5, lines 42 – 67].

18. As to claim 33, Fong as modified teaches a plurality of scheduling domains is associated with a different one of a plurality of runnable queues [col. 20, line 50 – col. 21, line 29 of Jones].

CONTACT INFORMATION

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Li B. Zhen whose telephone number is (571) 272-3768. The examiner can normally be reached on Mon - Fri, 8:30am - 5pm.

Art Unit: 2194

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng-Ai An can be reached on (571)272-3756. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Li B. Zhen
Primary Examiner
Art Unit 2194

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